

### **REMARKS**

Claims 27-56 were previously cancelled as being directed to a non-elected invention. New Claims 59-71 are presently added. Accordingly, Claims 1-26 and 57-71 are pending. A 37 CFR 1.132 Declaration by Dr. Harold Wiesmann accompanies this Amendment.

#### **First Rejection under 35 U.S.C. §103(a)**

Claims 1-22, 24, 26, 57 and 58 are rejected under 35 U.S.C. §103(a) as being obvious over *Ovshinsky* (U.S. 5,520,953) or *deBarbadillo* (U.S. 4,962,085) in combination with EP-286,135. (See Office Action page 3, paragraph 6.)

*Ovshinsky* and *deBarbadillo* describe methods and products which are fundamentally different from the methods and products of the present invention. These references individually, or in combination, do not render the present invention obvious, as discussed below.

#### **Present Invention (Claims 1-25)**

Claims 1-25 of the present application recite methods of making fluorinated precursors of superconducting ceramics. The steps of the method include spraying a precursor solution (comprising salts of a rare earth, of an alkaline earth metal, and of copper) onto a substrate to provide a precursor-covered substrate. The precursor-covered substrate is then fluorinated by heating in an atmosphere containing fluorinated gas. Claim 1 has been amended to define the fluorinated gas as comprising “at least one hydrofluorocarbon.” (Support for this amendment is in the paragraph bridging pages 13 and 14.) Upon fluorination, a fluorinated precursor is formed. To emphasize that a precursor is formed as opposed to a superconducting end product, Claim 1 includes the phrase “wherein the precursor is substantially non-superconducting.”

Thus, in the method of the **present invention** a **precursor is fluorinated** to form a fluorinated precursor.

**Ovshinsky (U.S. 5,520,953)**

On page 6, 1<sup>st</sup> paragraph, of the Office Action, the Examiner states that *Ovshinsky* teaches “fluorinating superconducting precursor materials prior to oxidation to form the final superconducting material.” Applicants respectfully assert that the Examiner is incorrect in his interpretation of *Ovshinsky*.

The method of *Ovshinsky* includes treating a precursor to provide a material with “at least one superconducting phase.” Then this material with “at least one superconducting phase” is exposed to fluorine. Thus, in the method of *Ovshinsky*, a **superconducting material is fluorinated**. A detailed discussion of the method of *Ovshinsky* follows.

*Ovshinsky* enumerate the “specific steps” of their method in column 9, lines 8-15. In particular, *Ovshinsky* state that their method “includes the specific steps of [Step 1] providing a precursor mixture...[and] [Step 2] subjecting said precursor mixture to a treatment process so as to form a substantially randomly oriented multi-grained material having said at least one superconducting phase...” Step 2 of their method involves exposure to a high temperature oxidizing environment. (See col. 11, line 67, to col. 12, line 1.)

Thus, the precursor of *Ovshinsky* is converted to a superconductor during Step 2 of their method.

In Step 3 of their method, *Ovshinsky* subjects the superconductor to “an orientation-inducing environment which is adapted to induce the alignment of the axes of the unit cells of at least a substantial percentage of the individual grains of the multi-grained material.” (See

col. 9, lines 8-15). The “orientation-inducing environment” can include fluorine exposure. (See col. 12, lines 35-39). Accordingly, the superconductor can be exposed to fluorine.

In his accompanying 1.132 Declaration (paragraphs 7-10), Dr. Wiesmann states that, in the relevant art, once a precursor has substantial superconducting properties, it is not typically termed a “precursor.”

Thus, *Ovshinsky* inartfully state that in Step 3 they subject “said *precursor* mixture” to fluorine. In Step 2 of their method, *Ovshinsky* stated that their material has “at least one superconducting phase.” Thus, it logically follows that in Step 3 of their method, a *superconducting material* is subjected to the fluorine treatment (i.e., not a precursor).

Nevertheless, regardless of what *Ovshinsky* calls the product of Step 2, *Ovshinsky* indicates that the product of Step 2 is a superconductor. This superconductor is the material that is fluorinated in Step 3, i.e., a superconductor is fluorinated.

Also, note that the inartful terminology in the specification does not appear in the claims. Claim 1 of the *Ovshinsky* patent recites Steps 1-3 as described above. Notably, the last step (i.e., Step 3) is as follows: “diffusing a fluorinated gaseous parametric modifier into the **superconducting** phase of the perovskite defect oxide type material so as to orient the axes.”

Thus, clearly, the method of the present invention is fundamentally different from the method of *Ovshinsky*:

In the method of present invention, non-superconducting precursors are fluorinated.

In the method of *Ovshinsky*, superconductors are fluorinated.

Due to the differences in the methods, different products are produced, i.e., non-superconducting fluorinated precursors *vis-à-vis* fluorinated superconductors.

Accordingly, *Ovshinsky* do not disclose all the claim limitations of the pending claims. Thus, the pending claims cannot be obvious in view of *Ovshinsky*.

Moreover, pending Claim 1 has been amended to define the fluorinated gas as comprising “at least one hydrofluorocarbon.” Support for this amendment is in the paragraph bridging pages 13 and 14 of the specification.

In contrast, the only fluorine-containing gases used by *Ovshinsky* are “selected [from] the group essentially consisting of F<sub>2</sub>, HF, SF<sub>4</sub>, SF<sub>6</sub>, NF<sub>3</sub>, NF<sub>5</sub>, PF<sub>3</sub>, PF<sub>5</sub>, BF<sub>3</sub> and combinations thereof.” (See col. 12, lines 22-24, of *Ovshinsky*.)

*Ovshinsky* do not even remotely suggest using hydrofluorocarbon gas. According to Dr. Wiesmann (paragraph 15 of his declaration), at the time of the present invention, “it would not have been expected that [hydrofluorocarbon] gases would be suitable for making fluorinated precursors.”

In summary, the present invention teaches fluorinating precursors; whereas, *Ovshinsky* teach fluorinating superconductors. Moreover, the present invention teaches hydrofluorocarbon gas; whereas, *Ovshinsky* do not even remotely suggest hydrofluorocarbon gas. Accordingly, *Ovshinsky* do not disclose all the claim limitations of the pending claims. Thus, the pending claims cannot be obvious in view of *Ovshinsky*.

**DeBarbadillo (U.S. Patent No. 4,962,085)**

The method of *deBarbadillo* includes treating a metallic precursor having a thin elongated structure by feeding it through an oxidizing zone such that the metallic precursor is zone-oxidized to an oxidic superconductor (col. 3, lines 6-19). Fluorine can be included in the atmosphere surrounding the oxidizing zone to provide a “fluoridized oxidic superconductor” (col. 3, lines 20-24). Thus, *deBarbadillo* teach simultaneously fluorinating and oxidizing a precursor to provides a superconductor containing fluorine.

Thus, clearly, the method of the present invention is fundamentally different from the method of *deBarbadillo*.

In the method of present invention, non-superconducting precursors are fluorinated.

In the method of Ovshinsky, superconductors are fluorinated.

Moreover, pending Claim 1 has been amended to define the fluorinated gas as comprising “at least one hydrofluorocarbon.” Support for this amendment is in the paragraph bridging pages 13 and 14.

In contrast, the only fluorine-containing gases used by *deBarbadillo* are “elemental fluorine, hydrogen fluoride, sulfur hexafluoride.” (See col. 3, lines 20-24, of *deBarbadillo*.)

Thus, *deBarbadillo* do not even remotely suggest using hydrofluorocarbon gas. According to Dr. Wiesmann (paragraph 15 of his declaration), at the time of the present invention, “it would not have been expected that [hydrofluorocarbon] gases would be suitable for making fluorinated precursors.”

In one embodiment of *deBarbadillo*, during the aforementioned treatment of feeding a metallic precursor through an oxidizing zone, *deBarbadillo* may dope the precursor with fluorine. The dopants are added by “using the technique of mechanical alloying of metal powder...” (See col. 3, lines 31-44.) *DeBarbadillo* refers to their previous application for the technique of mechanical alloying, i.e., U.S.S.N. 07/180,374, now U.S. 4,962,084. In U.S. 4,962,084, it is apparent that fluorine is added in solid form. For example, *deBarbadillo* states that the dopant form is “metal fluoride.” (See col. 4, line 17.) A specific example of a “metal fluoride” is disclosed in col. 5, line 14, as “cuprous fluoride powder.”

Thus, in this embodiment of *deBarbadillo*, fluorine is added as a solid to the precursor. In stark contrast, in the present invention, fluorine is added as a gas.

In paragraph 13 of the accompanying 1.132 Declaration, Dr. Wiesmann corroborates the above analysis. Moreover, Dr. Wiesmann states that the addition of fluorine as a solid results in a material that is physically different from a material in which fluorine is added as a gas. In the present invention, the addition of fluorine as a hydrofluorocarbon gas results in a microscopic distribution of fluorine in the precursor, thereby providing a substantially homogenous material. In contrast, by adding fluorine, as a solid as described by *deBarbadillo*, the fluorine does not come into intimate contact with the material, thus there is no microscopic distribution of the fluorine in the material.

In summary, the present invention teaches fluorinating non-superconducting precursors with hydrofluorocarbon gas; whereas, *deBarbadillo* teach fluorinating superconductors or adding a solid form of fluorine to a precursor. Moreover, the present invention teaches hydrofluorocarbon gas; whereas, *deBarbadillo* do not even remotely suggest hydrofluorocarbon gas. Accordingly, *deBarbadillo* do not disclose all the claim limitations of the pending claims. Thus, the pending claims cannot be obvious in view of *deBarbadillo*.

**Combination of *Ovshinsky* or *deBarbadillo* and EP-286,135**

The Examiner states that both *Ovshinsky* and *deBarbadillo* are deficient in that they fail “to teach spraying the superconductive precursor on a substrate to form a precursor film prior to adding the fluorine component.” The Examiner states that EP-286,135 teaches “flame spraying ceramic oxide superconductors.” (See Office Action page 4, 1<sup>st</sup> paragraph.) The Examiner alleges that it would have been obvious for a skilled artisan to have modified the *Ovshinsky* or *deBarbadillo* process “by spraying superconductive materials on the substrate...”

As described above, the Examiner incorrectly interpreted the primary reference of *Ovshinsky* as teaching a non-superconducting fluorinated precursor; and incorrectly interpreted the primary reference of *deBarbadillo* as teaching exposing a precursor to fluorine gas. Moreover, neither of the primary references discloses the hydrofluorocarbon gas of the present invention.

Accordingly, the primary references fail to teach the element of the claimed invention that the Examiner asserts is taught by the references. In such a case, a secondary reference (i.e., EP-286,135), in combination with the primary references or by itself, cannot support the obviousness rejection. Therefore, the obvious rejection is not viable; and Applicants respectfully request that it be withdrawn.

**Present Invention (Claim 26)**

Claim 26 of the present application is dependent on Claim 1. Claim 26 recites the additional step of converting the fluorinated precursor of Claim 1 to a crystalline superconductor.

Claim 1 recites a method of making substantially non-superconducting fluorinated precursor with hydrofluorocarbon gas. As discussed above in detail, neither primary reference teaches such a method. Accordingly, the further limitation in Claim 26 of converting the fluorinated precursor of Claim 1 into a superconductor can not render Claim 26 obvious over *Ovshinsky* or *deBarbadillo* in view of the secondary reference EP-286,135.

Thus, Applicants request that the obviousness rejection be withdrawn.

Moreover, the difference in the method of the present invention *vis-à-vis* the prior art methods yields products which are different from the prior art products. In particular, fluorine is **not** incorporated into the structure of a superconducting material of the present invention. Instead, the crystalline superconductors “contain only trace amounts of fluorine.” (See specification page 14, lines 22-23; and paragraph 5 of Dr. Weismann’s declaration.)

In contrast, *Ovshinsky* teach a method of structurally incorporating fluorine into the superconducting end product. For example, *Ovshinsky* state “Preparation in the aforescribed manner results in the fabrication of multi-grained perovskite ceramic based fluoro-oxide superconducting material...” (See col. 12, lines 48-55, of *Ovshinsky*; and paragraph 11 of Dr. Weismann’s declaration.)

As *Ovshinsky*, *deBarbadillo* teach a method of structurally incorporating fluorine into the superconducting end product. For example, *deBarbadillo* teach that fluorine is included in the atmosphere surrounding the oxidizing zone to provide a “fluoridized oxidic superconductor.” (See col. 3, lines 20-24. of *deBarbadillo*; and paragraph 14 of Dr. Weismann’s declaration.)



**Present Invention (Claims 57 and 58)**

Claims 57 and 58 recite a method of inhibiting the conversion of a fluorinated precursor film of the present invention into a crystalline superconducting film. The method comprises adding a small amount of fluorinated gas during a heat treatment process by which a precursor film is to be converted into a crystalline film. None of the cited references even remotely suggest such a method. (See paragraph 15 of Dr. Wiesmann's declaration.)

Accordingly, Applicants respectfully request that the obviousness rejection be withdrawn.

**Second Rejection under 35 U.S.C. §103(a)**

Claims 23 and 25 are rejected under 35 U.S.C. §103(a) as being obvious over *Ovshinsky* (U.S. 5,520,953) or *deBarbadillo* (U.S. 4,962,085) and in combination with EP-286,135, still further in combination with *Ovshinsky II* (U.S. 5,102,860) or JP 01-83651. (See Office Action page 4, last paragraph.)

As discussed above, the teaching of flame spraying (EP-286,135) and the further teaching of plasma discharge (JP 01-83651), do not remedy the deficiencies in the primary references. Further, as indicated by the Examiner, *Ovshinsky II* (U.S. 5,102,860), as *Ovshinsky* (U.S. 5,520,953), simply teach fluorinating a superconductor. In contrast, as discussed in detail above, the pending claims recite fluorinating a non-superconducting precursor. Thus, the deficiencies in the primary references are not remedied. Accordingly, Applicants respectfully request that the obviousness rejection be withdrawn.

### **New Claims**

New Claim 59 incorporates dependent Claim 26 into Claim 1. In particular, it recites transforming the fluorinated precursor of Claim 1 into a crystalline superconducting ceramic. Claim 59 also recites that the crystalline superconducting ceramic contains only trace amounts of fluorine. Support for this claim is found throughout the specification, including, for example, page 14, lines 22-23.

New Claim 60 corresponds with Claim 1 wherein the word “spraying” in step (b) of Claim 1 is replaced with “placing” Support for this claim is found throughout the specification, including, for example, page 10, line 7. New Claims 61-71 depend from Claim 60. New Claim 61-71 correspond with Claims 3-8, 12, 20, 21, 23 and 25, respectively.

Since none of the cited prior art references disclose a substantially non-superconducting fluorinated precursor and/or exposure to a hydrofluorocarbon gas, as recited by the new claims, the new claims are patentable over the prior art references for the same reasons that Claims 1-26 are patentable over the cited prior art references.

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Applicants respectfully submit that the application is now in condition for allowance, which action is earnestly solicited. If resolution of any remaining issue is required prior to allowance of this application, it is respectfully requested that the Examiner contact Applicants' undersigned attorney at the telephone number provided below. Please direct correspondence to the below address.

Respectfully submitted,



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